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The Development in Great Britain, 1949-52, of the Technique of Preserving Bull Semen in the Frozen State *

BY

A. S. PARKES

National Institute for Medical Research, Mill Hill, London, N.W.7

IN 1941 and 1942 Shaffner, Henderson and Card, working in the U.S.A., reported that by the addition of large amounts of laevulose to the suspending medium they had succeeded in reviving a proportion of fowl spermatozoa after freezing to and storage at −79° C. Moreover, following insemination of such spermatozoa they obtained a small number of fertilised eggs which, however, failed to develop. Shortly after the war, attempts were made by me and my colleagues to repeat and extend this work; in particular, early in 1946, we made a number of experiments, all unsuccessful, in Dr. S. J. Folley's laboratory at the National Institute for Research in Dairying, with bull semen obtained from Mr. D. L. Stewart of the Ministry of Agriculture at the Reading Cattle Breeding Centre, Shinfield.

Two years later Mr. C. Polge joined the staff of the Division of Experimental Biology at the National Institute for Medical Research, to assist with a programme of work on fowl spermatozoa, which are of especial interest because of their relatively long survival in the female reproductive tract. In the course of this work, further attempts were made by Mr. Polge and Dr. Audrey Smith to repeat the work of Shaffner, Henderson and Card. These attempts were again unsuccessful, but during the experiments it was observed accidentally, as fully recorded elsewhere (Parkes, 1956) that glycerol had remarkable powers of protecting fowl spermatozoa against the otherwise fatal effects of freezing and thawing (Polge, Smith & Parkes, 1949), and later work showed that fowl semen diluted to contain 15 per cent. glycerol and frozen rapidly to −79° C. was effective on insemination after several weeks storage at that temperature (Polge, 1951a, b).

The demonstration that fowl spermatozoa could retain fertilising power when frozen and stored in the presence of glycerol prompted further experiments on bull semen at Shinfield in December, 1949, and at the beginning of 1950 arrangements were made with Mr. Stewart for a regular supply of material to be sent to the National Institute for Medical Research. Mr. Polge and Dr. Smith very soon found that the method of comparatively rapid freezing in glycerol-containing media, which had proved successful with fowl spermatozoa, did not work with bull spermatozoa. At this stage, my colleagues, recognising the necessity for cooling bull spermatozoa slowly at temperatures above zero, introduced the idea of slow cooling below zero. This innovation—quite contrary to previous ideas of the requirements of cells for survival on freezing—proved remarkably successful and permitted the resumption of motility of more than half the spermatozoa after freezing to −79° C. and thawing (Smith & Polge, 1950a, b). At this point we suggested to Mr. Stewart that he should test the fertility of bull semen frozen and thawed by this method, and, after some further investigation by Mr. Stewart, as a result of which egg-yolk was added to the medium and the concentration of glycerol reduced, five cows were inseminated at Shinfield with frozen and thawed semen. One of these produced a bull calf towards the end of 1950 (Stewart, 1951). By the middle of 1950, however, it was evident that larger scale field trials were required and at an *ad hoc* conference called by the Agricultural Research Council at the end of July to consider other aspects of male gamete research, I asked whether arrangements could be made for a field trial of frozen semen on 100 cows. It was agreed that this should be done. Subsequently we had discussions with Dr. A. Walton

* This account has been approved by all those (other than the American workers) whose names are mentioned, and I am grateful for the help received in its preparation.—A. S. P.

and Mr. L. E. A. Rowson, Director of the Cambridge and District Cattle Breeding Centre. As a result, in the autumn of 1950, the National Institute for Medical Research hired and fitted out a caravan as a mobile laboratory to provide extra accommodation at the Cambridge centre and a field trial of the technique was made by Mr. Rowson. This trial established that the addition of 15 per cent. glycerol without freezing was harmless to the semen, but no pregnancies were obtained from semen which had been frozen and thawed.

In the following autumn of 1951, Mr. Rowson, in the face of general scepticism, agreed to another and more extensive field trial in Cambridge, and it was decided that on this occasion Mr. Polge should go to work at the centre for a couple of months to carry out the semen manipulations. A caravan was again hired, this time jointly by the Medical Research Council and the Agricultural Research Council, fitted out at the National Institute for Medical Research and stationed at the centre for two months to provide the necessary laboratory accommodation. In the course of work at the centre, Mr. Polge introduced several modifications of the technique, including the addition of glycerol-containing diluent to the semen at +5° C. and the overnight equilibration of the spermatozoa with the glycerol before freezing. Semen so treated and stored at −79° C. for periods from two hours to eight days and thawed immediately before insemination proved to have retained a high degree of fertilising power, and 30 out of 38 cows inseminated with such material were diagnosed by Mr. Rowson as being in calf (Polge & Rowson, 1952a). In the light of these results, the setting up of a long-term experiment became imperative, and early in 1952 Mr. Polge again worked at the centre preparing a "bank" of semen stored at −79° C. Tests of this material on 16 cows a month showed no diminution in conception rate with increasing storage time, and results obtained with semen stored up to eight months showed an over-all conception rate on 128 cows of 69 per cent. This information was published at the end of 1952 (Polge & Rowson, 1952b), and the stage was thus set for the rapid and successful extension of the frozen semen technique in cattle breeding, an extension in which Mr. Rowson and the Cambridge and District Cattle Breeding Centre have played a prominent part.

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Some Observations on Milk Fever

BY

LIONEL A. HEMSLEY

Croydon

THE routine case of milk fever acquires further interest if a blood sample is taken for analysis. This paper discusses clinical and biochemical observations on 67 unselected cows. My attempts to judge the blood mineral levels on the basis of symptoms displayed were without success, and I could not predict with confidence which cases were likely to relapse. In view of this failure to find any correlation between symptoms and particular blood mineral levels it has not been thought worth while to present in detail the data which was collected.

Full data was obtained for 61 of 67 initial milk fever occurrences, six of seven cases of insufficient response to treatment, 14 of 20 clinical relapses after treatment, and five cases of insufficient response to treatment after a relapse. Only cases occurring initially within 72 hours after parturition are considered. The cases were seen by the author during the periods of February 6th to September 21st, 1955 (32 cows), and June 15th to October 7th, 1956 (35 cows). Three cases of hypocalcaemia which occurred during the same period, but outside the 72 hours, are not included; apparent preparturient milk fever was shown by two Jersey cows, and one Jersey heifer was affected a week after parturition. With two exceptions the farms concerned were situated in the Severn valley, Worcestershire.

Incidence

The breed types of the cattle examined were: Friesian 26, Channel Island 17, Ayrshire 11, Shorthorn 11, and Hereford 2. So far as could be ascertained at least 20 cows had been affected at previous parturitions. Some two-thirds of the remainder were at the fourth or fifth parturition; at the limits of the range were an 11th calver and two second calvers, one of which was a Friesian which had given over 1,000 gallons of milk as a heifer.

Seven cows were seen affected with milk fever at consecutive parturitions. In three cows the interval between parturition and the onset of milk fever was about the same in both years. In all cases alterations in the blood mineral levels tended to be more severe in the second year, even though milder symptoms might be presented.

On the average, milk fever was seen at around 21 hours after parturition, ranging from at calving to 72 hours later, although 50 per cent. of the cases occurred between 17 and 30 hours and only one case occurred after 48 hours. Relapses occurred at various times after the initial attack, ranging from 10 to 96 hours (average 33 hours). These times refer to when the animals were examined and not to when the symptoms first appeared.

Results of Blood Analysis

The levels of serum calcium, magnesium, acetone, and whole-blood inorganic phosphorus were determined in all cases. Blood for the latter was collected

in bottles containing potassium oxalate and sodium fluoride. The acetone level was normal in all except one case which had a level of 15 mg. per cent. The figures discussed below refer to blood mineral levels which were obtained from 63 cows before treatment at the initial attack of milk fever, and these are compared with figures for normal cows in Table I.

TABLE I
BLOOD MINERAL LEVELS IN THE COW

	Calcium mg. per cent. serum	Magnesium mg. per cent. serum	Inorganic phosphrous mg. per cent. blood	Authority
Normal range ...	8·5–11·5	1·8–3·2	3·5–6·0	Ministry of Agriculture (Weybridge) Form D525/VL
Levels at parturition	9·5 (8·4–11·0)	—	3·0 (2·3–4·9)	Godden & Allcroft
Levels at 24 hours post-parturient	9·5 (7·2–11·2)	—	4·4 (1·8–8·4)	Godden & Allcroft
Levels observed in milk fever	4·4 (2·6–8·2)	3·1 (0·9–4·8)	1·9 (1·0–4·6)	(This paper)

In all the affected cows the calcium level was below normal, the bulk (50 per cent.) lying between 3.5 and 4.5 mg. per cent. The extent of this depression appears to depend on the duration of the milk fever, the lower levels usually being associated with delayed treatment. In concordance with other surveys the phosphorus level was found to be generally lowered, being under 3.5 mg. in 94 per cent. of the cases, while 70 per cent. ranged between 1.4 and 2.5 mg. per cent. inclusive. Cases occurring close to parturition did not tend to show levels lower than those which occurred 24 hours after parturition. In cows calving without incident the phosphorus level falls at parturition but approaches normal 24 hours later (Godden & Allcroft, 1932).

Marr, Moodie & Robertson (1955) observed a rise in blood magnesium levels during milk fever which was not significant when compared with the rise associated with normal parturition, when the magnesium may even rise to 3.5 mg. per cent. In my series the magnesium level was in the upper part of the normal range in 44 per cent. of the cases; levels above normal were presented by 40 per cent. of the cases, eight cows having levels over 3.5 mg. per cent. and one cow having a level below normal. The cases with magnesium levels below the middle of the normal range (16 per cent.) occurred before June and, in two cases, during October. Most of the cows were examined during the summer months when the magnesium level tends to be higher than during the rest of the year.

Symptoms of Milk Fever

The symptoms of the 63 initial milk fever cases sampled are considered below, and the approximate percentages given refer to this total.

In *expression* the cases might loosely be classified as depressed (48 per cent.), excited (22 per cent.), and comatose (30 per cent.). In some cases the depression was only slight and the animals retained interest in their surroundings, but generally the head was held low, the ears and tail were still, and the eye was "staring." The excited cases did not exhibit the hypersensitivity of grass tetany, but appeared to be delirious, the excitement being associated with difficulty in maintaining balance, or concern at an inability to rise. Cases of mild coma were relatively insensitive to their surroundings and not conscious of their inability to rise, while those in a deeper coma lay "muzzle to flank" or broadside, and exhibited an occasional jerk of the limbs or an attempt to throw the head back over the shoulder. It was noted during 1956 that cows which appeared to be in a deep coma were still sensitive to needle puncture, only two cows showing no response.

The *gait* of cows still on their feet was usually affected, this being an early symptom of milk fever. Stilting, with the angle of the hock eliminated, was seen in 12 cases (19 per cent.), and the five cases which paddled also showed stilting. A tremor of the hind quarters was noticed in two cases. The hind legs were usually held well apart to maintain balance, but a third of such cases went down during the injection.

The recumbent cows (48 per cent.) lay broadside (11 per cent.) or on their briskets, three-quarters of the latter having the *neck kinked* in an "s" bend (22 per cent.) or turned to the flank (6 per cent.). A kink did not usually occur in standing cases, even though it was often present when the cow became temporarily recumbent, but three exceptions were noted. Occasional symptoms included grinding of the teeth (11 per cent.) and flapping of the ears (10 per cent.); these were often seen in conjunction with drooping of the lower jaw and protrusion of the tongue (10 per cent.), presumably associated with the depressed state of consciousness rather than as a result of pain or rage. Relaxation of the *anal sphincter* with absence of the anal reflex was observed in only four of all the 1956 examinations, including relapses; these cases were in a deep coma and three of them were insensitive to needle puncture.

The *heart rate* averaged 80 beats per minute on auscultation which is usual for any cow under examination by a stranger. An increased rate of over 100 was observed in seven excited and three comatose cases, the highest rates being exhibited by two cows which were cyanosed. The *temperature* was

often depressed to an extent dependent on the duration rather than the depth of the milk fever, and was a useful indication of the rate of recovery to be expected. Temperatures below the normal minimum (100.5°) were registered in 25 per cent. of the cases, one-third of which were not comatose.

The *muzzle* in normal health is usually covered with small droplets of secretion, but in these cases of milk fever it was often dry (37 per cent.); sometimes an excess of moisture collected forming beads (15 per cent.) or an evenly moist surface (37 per cent.). There does not appear to be any certain relationship with the depth of milk fever, though the cows showing small droplets (11 per cent.) were in the earlier stages of the illness. Dry muzzles were shown by two-thirds of the cases which relapsed. I have observed a number of cows suffering from shock with normal blood mineral levels which had dry muzzles. Cows showing a slow response to treatment for some hours after a relapse had dry muzzles which may also have been associated with shock.

The *pupil* can be a valuable aid to diagnosis of any hypocalcaemia when examined for its reaction to a light stimulus such as a torch. The pupil usually fails to constrict to light as in 65 per cent. of 55 cases examined, and the area of the pupil may vary from almost normal to a striking expanse. In those cases where a light reflex was present (35 per cent.) the movement was often sluggish. In six cows there was an initial paralysis, but repeated stimuli produced reactions of increasing strength which were not always bilaterally similar. The animal appears to appreciate the light for it will sometimes move its head or its eyelids, and it is able to see obstacles too. A positive reflex was seen even in cows in a deep coma. Three cows showed a positive reflex at the first examination and a negative reflex after a relapse. Cases which relapsed were nearly always insensitive to light; one cow which relapsed presented exaggerated constriction of the pupil with an overlapping of the iris. The time taken for the return of the reflex after calcium treatment varied from almost at once to some minutes. I have observed failure to constrict in cows with normal blood calcium levels yet, after the administration of calcium, the pupil may respond to the stimulation.

Relationship of Symptoms and Blood Mineral Levels

Studies on the blood minerals of normal parturitions have revealed borderline cases in which levels fall well below average without obvious symptoms (Godden & Duckworth, 1935; Moodie, Marr & Robertson, 1955; Van Soest & Blosser, 1954). Three cases of "milk fever" with normal calcium levels have been described by Blood, Larsen & White (1949), but they did not estimate the blood phosphorus content. The degree of calcium fall before symptoms appear varies with individual cases, and symptoms appeared in one Jersey cow when the calcium level had only fallen to 8.2 mg. per cent. A slight malaise in another case was easily attributed to metritis following dystocia, yet the calcium level had fallen to 6.6 mg. and the phosphorus to 2.3 mg. per cent.; I suspect that cases such as this are not infrequent and recover spontaneously, though calcium treatment would be beneficial. One cow had a calcium level of 5.8 mg. per cent. and appeared almost normal, yet another, whose level was 5.2 mg. per cent., was in a deep coma. It would appear that in cases which have recovered from milk fever the calcium usually falls to pre-treatment level within a few hours without further symptoms (Marr, Moodie & Robertson, 1955), suggesting that the animal becomes accustomed to a lower blood calcium level.

The general symptoms of hypocalcaemia are characteristic whether they are associated with parturition or not. I cannot find any proportional relationship between symptomatology and calcium levels, even when magnesium and phosphorus are taken into account. This discrepancy is emphasised if the clinical pictures of cases with similar blood mineral levels are examined. A group of 12 cows had almost identical levels yet their appearances ranged from standing cases, through "down" and depressed cases, to those of deep coma.

Two interesting aspects of the relationship between symptoms and biochemistry are the influence of magnesium on consciousness and of phosphorus on the ability to stand. Barker (1939) classified his hypocalcaemic cases into:—

1. Reeling tetany-paresis-narcosis (with a neck kink). Serum magnesium raised, 3.3 mg. per cent.
2. Paddling tetany (with stilting)-paresis-coma. Serum magnesium normal, 2.3 mg. per cent.
3. Preconvulsive tetany-paresis-convulsion. Serum magnesium lowered, 0.8 mg. per cent.

Barker mentioned that these groups merged, and it should be emphasised that milk fever and grass tetany were considered together, class 3 being a classical description of the latter. I feel that if such a low magnesium level is found in a typical case of milk fever a second sample should be taken to ensure that a state of chronic "seasonal" hypomagnesaemia does not co-exist.

It was not often possible to obtain a history describing the sequence of symptoms in my cases. Paddling had preceded coma in one cow which, incidentally, was the only case of hypomagnesaemia, but the usual history was reeling-paresis-coma with a "neck kink." Stilting, coma, and the neck kink did not appear to be related to any particular magnesium level. Two of my cases made an interesting comparison: although they had similar calcium and phosphorus levels, one had the lowest magnesium level recorded but was deeply comatose, while the other, with the highest magnesium level, was still standing.

Excitement could not be attributed to hypomagnesaemia, but probably to a calcium level not lowered sufficiently to have a sedative effect in an animal aware of the loss of locomotor control. Study of the calcium: magnesium ratio *suggests* that as it falls from the normal of 4:1 the subject becomes more "anaesthetised"; thus the "excited" group averaged 1.8:1, the "depressed" group 1.5:1, and the "comatose" group 1.1:1. There are, however, some striking exceptions—excited 1.2:1, depressed varying from 4:1 to 0.8:1, and comatose 4.3:1.

It is relevant to refer to three cases of inapparent hypomagnesaemia which I have observed. These had a high ratio of calcium to magnesium but showed symptoms of coma (9:1) and depression (10:1, 7:1) which were indistinguishable from milk fever. In general, the comatose cows had low calcium levels and the excited cows had relatively high ones.

Cows are able to rise at various calcium levels, though allowances must be made for temperament. In view of the importance of phosphorus in muscle metabolism an early state of recumbency might be expected in cows with a marked hypophosphataemia, but this was not so. The lowest calcium level recorded in a standing cow was 3.0 mg. per cent.: the usual figure was over 3.7 mg. per cent., but at this level three-quarters of the cases were down. The two recumbent cows with the highest calcium levels (5.8 and 6.1 mg. per cent.) struggled wildly but could only raise their hind quarters, yet their phosphorus readings were 4.0 and 3.3 mg. per cent. Was this recumbent state the result of a high phosphorus requirement, the hypocalcaemia, or some other factor? One case rose only after numerous strenuous attempts at a phosphorus level of 3.0 mg. per cent., yet another cow with a similar calcium level but with a phosphorus level of 1.4 mg. per cent. could rise and stand with ease. The phosphorus range and average level for recumbent cows not affected with coma were similar to those of cows which were still able to stand.

Unsatisfactory Response to Treatment

Out of 67 cows affected with milk fever, six (9 per cent.) showed insufficient response after the first treatment. Two of these failed to rise despite the absence of signs of hypocalcaemia. Clinical relapses occurred in 20 cases (30 per cent.), and these subsequently resulted in five further cases of insufficient response to treatment, four cases becoming recumbent. Only one cow relapsed for a second time in this series. This number is too small to draw any firm conclusions, and it was not always possible for the author to attend at each professional visit. Out of 755 cases recorded by Lewis (1955), 30 per cent. required supplementary calcium treatment, while 25 per cent. showed a clinical relapse and 12 of the animals were in a recumbent state for a considerable period. Hallgren (1955) investigated 77 cases of unsatisfactory response to therapy, usually intravenous calcium borogluconate, representing 15 per cent. of the cases of milk fever attended by a district veterinarian in Sweden; 1.4 per cent. of this total had a relapse after treatment. Clinically, 32 cases were typical "downers," a description given to alert cows which are unable to rise, and of these, 17 had hypophosphataemia and six had a rather low calcium level too. Robertson (1948, 1949) examined two "downers" following milk fever and found a lowered blood phosphorus level. He also described two "downers" which had not shown symptoms of hypocalcaemia, one of which had hypophosphataemia.

Marr, Moodie & Robertson (1955) record an unsatisfactory response in 28 (41 per cent.) out of 68 animals, the majority of which were definite cases of clinical relapse, while a few showed dullness and anorexia. They do not mention any "downers" in this section. Their informative article substantiates most of the impressions gained from my few cases, and the exceptions I note below are hardly on an equal footing. In agreement with their findings, the initial milk fever blood mineral levels or ratios which occurred in my cases showed no characteristic association with a relapse. The five comatose cases which relapsed had somewhat lower calcium levels than usual, perhaps as a result of delayed treatment. The phosphorus levels in 14 cases averaged 2.1 (1.0 to 3.2) mg. per cent. at the initial attack of milk fever, with a figure of 2.4 (1.4 to 6.1) mg. per cent. for the animals which relapsed; these are greater than their equivalent figures. This difference might be associated with a longer post-parturient interval for the earlier writers found that the initial attack of milk fever occurred close to calving, the average interval being 6.5 hours. The average interval for my 14 cases was 17 hours (range 0 to 36 hours), which differs but little from the 21 hours for cases which showed a satisfactory response to treatment. They found that "moderate" cases tended to relapse, but my cases could be classified as "moderate" (three), "mild" (eight), and "severe" (seven).

In regard to prevention, complete milking out had preceded only about half the cases which relapsed; this procedure, therefore, is of uncertain significance in precipitating a relapse. The influence of the therapeutic agent used in the first treatment is also uncertain. Marr, Moodie & Robertson (1955) doubt the value of including phosphorus since it can result in calcium depression. I noted that in two cows the use of calcium alone was followed by a depression of the phosphorus level. A compound mineral solution* was administered to 10 cases and calcium to eight, so the value of the former in preventing a relapse is inconclusive; in any case, calcium borogluconate (350 c.c., 25 per cent.) was used satisfactorily in 80 per cent. of the simple cases of milk fever in 1955. In 1956, for comparison, mineral solutions were used as a routine and were satisfactory in 60 per cent. of the cases. The route employed did not appear to be significant—intravenous, subcutaneous, or both methods being employed—and some animals remained recumbent after the use of both types of solution.

The characteristic picture of a "downer" is that of a cow which is alert and struggling to rise; however, she cannot extend her hind legs fully, as though some nerve paralysis had resulted from parturition, and yet the "paralysis" may develop some hours after parturition. There may be no hypocalcaemia at any stage and the animal may ruminate contentedly. A mild hypophosphataemia of 3.3 mg. per cent. was shown by a cow not included in the milk fever series (the calcium level being 8.5 mg. per cent.) which rose

* 400 c.c. calcium borogluconate 20 per cent.; phosphorus content 0.5 per cent.; magnesium content 0.2 per cent. Eleven cases satisfactory response, eight cases unsatisfactory. 350 c.c. calcium borogluconate 25 per cent.; magnesium hypophosphite 5 per cent. (phosphorus content 1.2 per cent.; magnesium content 0.5 per cent.); dextrose 10 per cent Seven cases satisfactory response, two cases unsatisfactory.

to its feet a few hours after treatment with a compound solution. The same picture is seen after simple or compound cases of milk fever, and in the post-treatment recumbent cases, four of which were sampled. Four other recumbent cows were still stupefied, having persistent hyocalcaemia and hypophosphataemia. Of the typical "downers," one cow which failed to rise after the initial treatment had hypophosphataemia only (phosphorus 1.5 and calcium 9.3 mg. per cent.) and took two days to rise despite further phosphorus therapy (double phosphorus: 400 c.c. dextrose 20 per cent.; phosphorus content 1.8 per cent.). In two cows hypocalcaemia was predominant and they were on their feet within a few hours. The fourth cow had both low calcium and low phosphorus levels but failed to rise after these had been restored to normal, probably on account of her poor condition. In treating these cases the use of a solution containing phosphorus may be undesirable in view of the difficulty in distinguishing a hypophosphataemia case from one of concealed hypocalcaemia. A solution containing phosphorus had no beneficial effect in the case of the cow which was recumbent for two days, and a real rise in blood phosphorus was found only in one out of four cows which were treated with a compound solution when they relapsed and were subsequently sampled. The effect of such solutions requires more extensive study. Inflation of the udder was not employed but it appears to be of value in the case of "downers," a number of authors having observed a rapid rise in calcium and phosphorus levels after its use.

Use of Dihydrotachysterol in the Prevention of Milk Fever

Lewis & Burrow (1953) observed that the administration of dihydrotachysterol intramuscularly to cows resulted in an appreciable rise in calcium but an alarming fall in blood phosphorus levels, even to a mere trace, with no obvious symptoms. The manufacturers advise that a rise in the serum calcium will occur by 12 hours and be maintained for over 72 hours.

Apparent success was achieved in two cows using an intramuscular dose equivalent to 9 mg. crystalline dihydrotachysterol.* One shorthorn cow had been affected with milk fever, usually at 24 hours, after her third, fourth, fifth, and sixth parturitions: dihydrotachysterol was injected eight hours after the seventh parturition and milk fever did not develop. However, she had a low milk yield and was affected with *Corynebacterium pyogenes* mastitis in one quarter. Another Friesian-Shorthorn cross cow had milk fever about two hours after her third, fourth, and fifth parturitions. Dihydrotachysterol was injected 16 hours before parturition and her yield was over 8 gallons a day without any symptoms. I have noted one exception, a Jersey cow which developed milk fever 19 hours after the injection and had a relapse 24 hours later. Further information on the clinical use of this substance would be of interest.

* "Calten" Bayer Products Limited.

Summary

Clinical and biochemical data for 67 cases of milk fever seen in practice are discussed.

It was not found possible to correlate symptoms with particular blood mineral levels or ratios.

Unsatisfactory response to treatment was seen in 27 cases, of which 20 were cases of clinical relapse.

The use of dihydrotachysterol in prevention is mentioned.

Acknowledgment.—The biochemical analyses were kindly undertaken by the staff of the Biochemistry Department, Veterinary Laboratory, Weybridge.

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PRESERVING MEAT BY ULTRA-VIOLET LIGHT

The success of the first shipment of chilled Australian beef to the United Kingdom under ultra-violet light has resulted in another being sent. This is now on its way.

The ultra-violet preserved meat arrived in Britain last October in the first full-scale commercial test and it confirmed expectations, according to the Australian Meat Board.

It is hoped the system will assist the Australian chilled beef trade to compete with the more favourably situated Argentine trade.

The purpose of the trial cargo was to compare the meat from a locker under ultra-violet light to that from an identical locker under the normal 10 per cent. carbon dioxide.

According to the Board, the beef from the experimental locker was indistinguishable from that from the normal locker after a 47-day voyage.

The main advantages of the system are that more vessels can carry chilled beef as they do not require special gas-tight lockers; nor do they need to be fitted with expensive carbon dioxide metering and recording equipment.

A Report on Some Uses of Glycyrrhetinic Acid in Small-animal Practice

BY

O. F. JACKSON and ELIZABETH K. M. JACKSON

Darlington

SOME years ago it was demonstrated that liquorice had a deoxycortone-like activity, and immediate interest was aroused in the active principle glycyrrhetinic acid, the aglycone of the sweet principle of liquorice. Following the success of hydrocortisone, applications containing glycyrrhetinic acid were also found to have anti-inflammatory properties (Adamson & Tillman, 1955). Reports on the various trials were confusing, for whereas in some cases dramatic cures were achieved, in others results were disappointing (Warin & Evans, 1956). It has been shown recently that the confusing results obtained may have been due to impurities and different mixtures of the various isomers of the acid (Colin-Jones, 1956). These isomers vary considerably in their pharmacological action and this report deals entirely with the action of these particular active isomers of glycyrrhetinic acid* which has met with success in human dermatology (Evans, 1956).

Glycyrretinic acid is purely an anti-inflammatory agent, and therefore where there is bacterial infection an antibiotic must be employed simultaneously. At first we used 5 per cent. chloramphenicol† in propylene glycol in addition where necessary, but later a 2 per cent. glycyrrhetinic acid ointment with 0.5 per cent. neomycin sulphate was produced, which we have found more suitable than the simple ointment for veterinary practice.

Glycyrrhetinic acid may be used in any external inflammatory condition but we have found it particularly useful in otitis externa, certain non-specific dermatoses, and in chronic anal adenitis.

Glycyrrhetinic acid ointment with neomycin is effective in cases of long standing wet ulcerative otitis externa, the speed of relief to the dog being particularly marked. It has also proved effective in " closed up " terrier ears, where, although there appears to be little infection, a chronic inflammatory lesion exacerbated daily by scratching has resulted in a condition in which the external meatus is almost or completely occluded. In all cases we have swabbed the ear out with dilute cetrimide solution before applying the glycyrrhetinic acid ointment liberally. The makers recommend that the ointment should be applied two or three times a day, but as is well known in veterinary practice few owners will attend to an ear more than once a day, and in the majority of cases we have seen, that is all that has been done.

Our trials with glycyrrhetinic acid preparations cover a period of over six months, and the case report table of 12 cases represents a fair cross-section of our experience with this product in the treatment of otitis externa. It must once again be emphasised that glycyrrhetinic acid is purely an anti-inflammatory agent, and we do not claim that by itself it will cure infected otitis externa. It is merely that it shortens the recovery period when used in conjunction with a suitable antibiotic. Cases 3, 4, and 5 were all treated for long periods (months) with antibiotics; penicillin, streptomycin, chloramphenicol, and oxytetracycline all being tried. The improvement when the cases were transferred to glycyrrhetinic acid ointment with neomycin was very marked. It could be argued that we have at no time used neomycin by itself, and that therefore our favourable results in these cases could be due to the antibiotic alone, but this we would not accept as we had already used antibiotics of equally wide spectra.

As regards skin conditions we have found fewer uses for the product under discussion than might be expected, mainly because the majority of skin lesions in the dog are, after all, parasitic, and have their own specific treatments. For the same reason it is difficult to assess results, as although we have cured various " non-specific " skin conditions with glycyrrhetinic acid ointment with neomycin, we obviously, by this very definition, do not know what we have cured! We have, however, found it effective in small patches of non-specific pruritis, and in particular we have used it with success in the treatment of long-standing hardened eczematous patches, usually found on the dog's fore leg, a condition which we previously had found most stubborn. We have found that the best results are obtained if the ointment is applied at least twice a day.

We have recently tried glycyrrhetinic acid ointment with neomycin in the treatment of chronic anal adenitis, and so far results have been good. The ointment was injected into the anal sac by means of an anal gland cannula at weekly intervals for four weeks. We have also found it effective in cases of anal adenitis with associated pararectal sinuses. In treating this condition the ointment was applied externally twice a day, as well as being injected into the anal gland itself weekly. In one case the sinuses were practically healed within three days, and in another the sinus tissue at first healed very rapidly, but later the condition recurred as the duct to the gland was so thoroughly blocked that we could not clear it even with the cannula. We had therefore to resort to surgery.

Glycyrrhetinic acid is also used in human ophthalmology, in the treatment of conjunctivitis, keratitis, etc., but we have not yet used it in a sufficient number of eye cases to include our findings in this report.

* Biosone G. A., Biorex Laboratories Ltd.

† Chloromycetin.

Subject	Condition	Treatment	Result	Remarks
1. Alsatian, 1year	Inflammation from scratching an otodectic infection. Both ears	G.A. ointment once daily. 7 days	Inflammation subsided. The otodectic infection was then treated successfully with parasiticides	—
2. Spaniel, 8 years	Long-standing, ulcerative wet otitis. One ear	G.A. ointment once daily. 21 days	Worse	This was before we used an antibiotic. Unfortunately the dog was destroyed before G.A. with neomycin was introduced
3. Terrier, 7 years	"Closed up ears." Both ears	G.A. lotion and 5 per cent. chloromycetin once daily. 7 days	Great improvement	—
4. Labrador, 8 years	Long-standing, ulcerative *Pseudomonas aeruginova* infection. One ear	G.A. ointment once daily. 7 days	No improvement	Treated formerly with proprietary canker lotions, and antibiotics including chloromycetin. Aural resection performed
		G.A. ointment with neomycin. 7 days	Great improvement, ulcers healing	Terramycin produced an apparent cure, but condition recurred in 2 weeks
		3 weeks	No visible discharge	This dog has now started a similar condition in the other ear, which is responding to G.A. with neomycin, plus terramycin ointment
5. Spaniel, 8 years	Long-standing, scabby condition with occasional flare ups into a wet otitis. Both ears	G.A. lotion twice a day. 3 weeks	Not much improvement.	This dog had been formerly treated as No. 4. The G.A. and neomycin has proved more effective than other treatments, but the condition is not cured
		G.A. ointment with neomycin once daily. 1 month	Great improvement, but there is still some discharge	
6. White West Highland, 3 years	Wet otitis, greatly aggravated by scratching. One ear	G.A. lotion. Twice a day. 3 weeks	Inflammation reduced but still discharging	—
		G.A. lotion. 5 per cent. chloromycetin, once daily. 7 days	Cured	—
7. Terrier, 9 years	Chronic suppurative otitis submitted by another veterinary surgeon for aural resection. Both ears	Dressed during operation with G.A. ointment and terramycin ointment	Excellent	The cleanest aural resection wound that we have so far managed to achieve
		After 3 days redressed, and then daily for 5 days	Stitches out 8th day, first intention healing	
8. Terrier, 6 years	"Closed up" ear. Very painful. One ear	G.A. ointment with neomycin. Once daily for 7 days	Great improvement. Inflammation subsided and the ear comfortable	Two weeks later there was a slight discharge, which responded to chloromycetin
9. Spaniel, 8 years	Wet ulcerative otitis. Both ears	G.A. ointment with neomycin once daily. 10 days	Pain gone. Examination now possible, showing proliferative granulations right down the canal.	Very great improvement, after some months the ears are still comfortable, but will probably never be entirely cured because of the proliferative granulations
		3 weeks	Ears appear wet, but no suppurative discharge	
10. Cat, 12 years	Inflammation and suppurative mess after a haematoma operation due to the cat scratching the wound	G.A. ointment with neomycin, once daily. 7 days	Excellent	—
11. Sealyham, 10 years	"Closed up" ears, suppurative and painful. Both ears	G.A. ointment with neomycin once daily. 12 days	Great improvement	—
			Still under treatment	—
12. Retriever, 8 years	Otodectic infection with great oedema due to scratching. One ear	G.A. ointment with neomycin, daily. 5 days	Oedema gone	Then treated successfully with parasiticides

Conclusion

Glycyrrhetinic acid would appear to have a definite place in small-animal practice. We ourselves have found it useful in otitis externa, and in various skin conditions; but it is possible that there is a far wider field in which it may prove useful. It is of particular interest to veterinary surgeons in that whereas cortisone products are prohibitive in price to all but the most wealthy clients, glycyrrhetinic acid preparations are within the poorer client's means.

This report deals with the uses of a mixture of active isomers of glycyrrhetinic acid, in the form of a 1 per cent. lotion, a 2 per cent. ointment, and more particularly as a 2 per cent. ointment combined with

(*Concluded at foot of col. 1, page 471*)

The Benzidine Test for Occult Blood in Canine Faeces

BY
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IT is often important in the differential diagnosis of canine gastro-intestinal disease to know if the faeces contain blood; as the latter is not always visible, a chemical method must be used.

Various methods have been employed for the detection of occult blood such as the benzidine, guaicum, ortho-tolidin, and phenolphthalein reactions and spectroscopy. In veterinary medicine, the benzidine test is often used and is considered to be one of the most sensitive means of detection (Bloem, 1933). Working with human faeces, Gregersen (1919) considered the test to be too sensitive as generally used, giving positive results where pathological amounts of blood are absent from the faeces. With regard to the exact nature of this reaction, most authorities (*e.g.* Everett, 1946; Hawk, 1954) consider that active oxygen released from hydrogen peroxide or peroxides by peroxidase or peroxidase-like substances, combines with the benzidine to form a blue diazo-dye. In this respect, haemoglobin acts as a thermostable peroxidase. The benzidine test is, therefore, not specific for blood. Chlorophyll, some haemoglobin derivatives, hypochlorites, formalin, gluten, pus, nasal secretions, milk, plant cells, and plant juices can give positive reactions (Glaister, 1953; Bell *et al.*, 1956).

There has been doubt as to whether iron either in the inorganic or organic form can give a positive reaction. Some workers consider that iron drugs will create " false positives " if fed to a person whose faeces are being tested (Bell, 1923), while others maintain that this is not so (Ogilvie, 1927). Bell *et al.* (1956) state that only organic iron compounds will give a positive reaction. The present communication deals with the usefulness of this test in canine medicine.

Method

The method of performing this test varies slightly with different authors (Lyle *et al.*, 1914; Ingham, 1932; Boddie, 1950).

Boiling of the faecal suspension for at least two minutes is advised in most works (Harrison, 1947; Boddie, 1950), but in the Gregersen slide method (Gregersen, 1919) where the faecal sample is not suspended in water, no heating is involved. Theoretically, boiling would appear to be essential in order to destroy peroxidase and other thermolabile substances in the faeces capable of giving a positive reaction. In human medicine, meat and chlorophyll are sometimes eliminated from the diet for a period before performing the test. As an alternative to this, a way of interpreting the test (Boddie, 1950) has been considered equally efficient in obviating any errors in the diet. Hawk (1954), however, mentions that Vaughn considers that pus, " the usual drugs," and food do not interfere with the reaction.

Throughout the series of experiments, the following technique was used:—

1. All glassware and utensils were thoroughly cleaned by consecutive rinsing in potassium dichromate solution, tap water, distilled water, alcohol, and ether. It was found that even minute traces of dust, dirt, or packing material were sufficient to cause positive reactions.

2. A pea-sized mass of faeces was taken from the rectum and shaken up with 5 ml. distilled water. The suspension was then boiled for two minutes and allowed to cool. At this point, after centrifugation, the aqueous extract was used for the test or, if any acidified ether extract was required, 5 ml. of ether acidified with two drops of glacial acetic acid were added and the whole well shaken up and then centrifuged.

As a comparison in these experiments both aqueous and acidified ether extracts were employed. A pure ether extract is useless for the test as a pilot experiment using a solution of blood showed.

3. To 2 ml. of a saturated solution of benzidine in glacial acetic acid, 3 ml. of 3 per cent. hydrogen peroxide were added. Two drops of the aqueous or ether extract were added to this mixture from a Pasteur pipette. The dogs used in these experiments were of various breds, but were predominantly Greyhounds. All " normal " dogs had neither history nor clinical signs of disease.

Interpretation

A scale similar to Gregersen's (1919) was used to grade the colour intensity of subsequent reactions.

Plus 4.	Deep blue within three seconds.
Plus 3.	Deep blue reaching its maximum depth of colour within 12 seconds.
Plus 2.	Pale blue or green within 30 seconds.

A Report on Some Uses of Glycyrrhetinic Acid in Small-animal Practice.—*Concluded.*

a 0.5 per cent. neomycin sulphate. We are indebted to Biorex Laboratories Ltd., for supplies of the products for these trials.

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Plus 1. Pale blue or green appearing after 30 seconds.

Negative. No colour change within two minutes.

Results

Experiment 1

To determine the reaction of the faeces of normal dogs using an aqueous extract.

No. of Dogs	*Reaction (Aqueous Extract)*
14	All dogs gave a + 4 reaction.
Distilled Water Control.	Negative.

Note.—The " normal " diet used in these experiments consisted of bread and meat.

Experiment 2

To compare the reactions of the faeces of normal dogs using acidified ether and aqueous extracts.

No. of Dogs.	*Reaction. (Unacidified Ether Extract)*	*Reaction. (Aqueous Extract)*
10.	5 dogs gave a + 4 reaction. 5 dogs gave a + 3 reaction.	5 dogs gave a + 4 reaction. 5 dogs gave a + 3 reaction.
Distilled Water Control.	Negative.	Negative.

Experiment 3

To determine the reaction of the faeces of dogs fed for 90 hours on bread alone.

No. of Dogs.	*Reaction. (Unacidified Ether Extract)*	*Reaction. (Aqueous Extract)*
8.	2 dogs gave a + 3 reaction. 2 dogs gave a + 2 reaction. 4 dogs gave a negative reaction.	1 dog gave a + 1 reaction. 7 dogs gave negative reactions.
2 *Control Dogs on Meat and Bread Diet.*	Both dogs gave a + 4 reaction.	1 dog gave a + 4 reaction. 1 dog gave a + 3 reaction.

Experiment 4

To determine the reaction of the faeces of dogs with obvious enterorrhagia.

No. of Dogs.	*Reaction. (Acidified Ether Extract)*	*Reaction. (Aqueous Extract)*
4.	All 4 dogs gave a + 4 reaction.	3 dogs gave a + 4 reaction. 1 dog gave a + 3 reaction.
2 *Control Normal Dogs.*	1 dog gave a + 4 reaction. 1 dog gave a + 3 reaction.	Both dogs gave a + 4 reaction.
5 *per cent. Canine Blood in Distilled Water.*	The solution gave a + 4 reaction.	The solution gave a + 4 reaction.

Experiment 5

To determine the reaction of the faeces of normal dogs fed upon uncooked meat alone for 90 hours.

No. of Dogs.	*Reaction. (Acidified Ether Extract)*	*Reaction (Aqueous Extract)*
2.	1 dog gave a + 4 reaction. 1 dog gave a + 3 reaction.	Both dogs gave a + 3 reaction.
2 *Control Dogs on Meat and Bread Diet.*	Both gave a + 4 reaction.	1 dog gave a + 4 reaction. 1 dog gave a + 3 reaction.

Experiment 6

To determine the reaction of faeces of normal dogs fed upon cooked meat alone for 90 hours.

No. of Dogs.	*Reaction. (Acidified Ether Extract)*	*Reaction. (Aqueous Extract).*
4.	2 dogs gave a + 4 reaction. 2 dogs gave a + 3 reaction.	All 4 dogs gave a + 4 reaction.
2 *Control Dogs on Meat and Bread Diet.*	1 dog gave a + 4 reaction. 1 dog gave a + 3 reaction.	Both dogs gave a + 4 reaction.

Discussion

These results show that the benzidine test in the form used is incapable of differentiating between the faeces of dogs with enterorrhagia and the faeces of those which have been fed on bread and cooked meat, cooked meat alone, or uncooked meat alone.

Since dogs fed upon bread alone give a reduced reaction it might be possible by taking appropriate dietary measures for a period before performing the test, and by using aqueous extracts of faeces to detect occult blood in the faeces. This régime, together with the meticulous cleanliness and care necessary, would tend largely to limit the use of the test to the laboratory. The statement (Boddie, 1950) that a positive reaction within 30 seconds is always indicative of occult blood, irrespective of the diet, does not seem to be true in the case of the dog.

Summary

1. Experiments were carried out to determine the utility of the benzidine test for occult blood in canine faeces.

2. Partial or complete meat diets gave faecal reactions identical to those obtained when blood was present, whereas a bread diet reduced the speed of the reaction.

3. The limitations of this test in canine practice are discussed.

Acknowledgment.—My thanks are due to Dr. A. Greig and Dr. W. F. H. Jarrett for their advice and criticisms.

Addendum

Although it was impossible during the above experiments to test the faeces of dogs with enterorrhagia after preliminary dietary adjustment, I have recently, since completion of the work, been able to examine the faeces of three dogs with enterorrhagia. The

(*Concluded at foot of facing page*)

In Brief

NEOPLASMS

THERE are no spectacular advances to report in respect of neoplasms in domesticated mammals, but increasing interest is being shown in such tumours, not only for their own sake, but also, and more particularly, because of the possible significance a study of such neoplasms may have in relation to the problem of cancer in man. As regards the neoplasms of farm animals, much work is naturally being done in the U.S.A., where the large numbers of animals slaughtered annually provide an unrivalled supply of material. Great Britain is rather lagging behind in this work: this may partly be because the most common tumour of cattle reported from abattoir surveys in America—" cancer eye " (bovine ocular squamous-cell carcinoma)—does not occur to any important extent in this country, although it is by no means unknown.

What promises to be the most intensive study ever made of a particular kind of cancer in domestic mammals is now under way in America (Russell, Wynne & Loquvam, 1956) on this " cancer eye " condition of cattle, which has a rather striking incidence in the south-western States. In their excellent and profusely illustrated paper, Russell *et al.*, critically review the literature, and give an account of the pathological findings so far made. The most common site of origin of the ocular carcinoma was the corneo-scleral junction, particularly at the lateral aspect of the limbus away from the third eyelid. A particular study of the site of origin and mode of development is reported, as this may help in deciding what sort of causative agent may be at work: the occurrence of a papillary stage in the development of the tumour would be in accord with a viral origin, for example.

An observation was made which might be helpful in assessing prognosis in cases encountered in this country: carcinomas arising on the cornea or the corneo-scleral junction showed much less tendency to metastasise than did those lesions arising from the remaining conjunctival surfaces.

It is interesting to note that in Madras, Chandrasekharan Nair and Sastry (1953-4), in a survey of 2,003 tumours, chiefly of external origin (1,943 from cattle, 60 from buffaloes), examined in the Pathology Department of Madras Veterinary College in 1940-51, also found " cancer eye " to be by far the commonest single tumour, there being 850 cases—nearly twice as many as cases of " cancer of the horn core " (465). This latter tumour has not been reported in this country, and yet is of frequent occurrence in Indian cattle. Its cause it not known, although it has been suggested that photo-sensitisation of the squamous cells of the epidermis at the base of the horn may have some part to play. This chimes very well with the remark of Huxley (1956) that local application of carcinogenic agents to the horn bases of young ruminants should be relevant to the cancer problem, since here is a local area of high proliferative rate. (Incidentally, Huxley's review is full of stimulating ideas.)

Another interesting paper, which may have importance for clinicians in this country, is that by Monlux, Anderson, Davis & Monlux (1956), who, extending observations previously made by European workers on adenocarcinoma of the bovine uterus, have drawn attention to a number of cases of this kind in cows. They further point out that many tumours in the lungs of cattle may actually originate in the uterus. They found most of the uterine tumours in their series to originate in the cornua, where " the tendency for the lesions to form a sclerotic annular constriction without perforation of the serosa and little or no extension onto the surface of the endometrium [was their] most consistent feature." The growths, and their metastases, were yellow to grey, and quite fibrous or even nodular. These authors draw attention to the possible economic importance of such tumours.

More recently, a review has been published (Monlux, Anderson & Davis, 1956) of tumours encountered at slaughter in Denver, Colorado, in cattle (908 tumours), sheep (66), and pigs (28). Of the bovine tumours, far and away the commonest were again the " cancer eye " lesions (reported in detail by Monlux, Anderson & Davis, 1957), but other tumours of some importance were adenocarcinoma of the uterus, Schwann-cell tumours, and lymphosarcomas. Little is known about the incidence of the first two of these latter three tumours in this country, but lymphosarcomas, sometimes in the form of lymphatic leukosis (lymphadenosis), are not absolutely rare. No permanent cure is as yet know for lymphadenosis in cattle, or, indeed, in other species.

E. COTCHIN (February, 1957).

(*Concluded at foot of col.* 1 *overleaf*)

The Benzidine Test for Occult Blood in Canine Faeces. —*Concluded.*

faeces of the three dogs after 90 hours on a bread diet all gave a +4 reaction, while those of two control dogs on a similar diet were negative in reaction.

These results support the observations made in the discussion on the necessity for preliminary dieting in the clinical use of the benzidine test.

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Current Literature

BOOK REVIEW

Mönnig's Veterinary Helminthology and Entomology. Fourth Edition. By GEOFFREY LAPAGE, M.D., M.A., M.SC. Baillière, Tindall & Cox. Price 42s.

This fourth Edition of Mönnig's well-known text-book of Veterinary Helminthology and Entomology will be welcomed by veterinarians, parasitologists, and students. This edition has been revised by Dr. Geoffrey Lapage working in consultation with the original author.

The new author has preserved much of the original style and format, but some chapters have been re-written and fairly extensive changes have been made in the section on entomology, and more modern terminology has been used.

In his preface to the Fourth Edition the author stresses the difficulty of bringing a scientific book strictly up to date owing to the rapid advance of knowledge in modern times. This is exemplified in the book itself as references to new methods of treatment are not as up to date as the author would, no doubt, have wished them to be. For example, though reference is made to the fact that piperazine adipate is partially effective against *Strongylus vulgaris*, no mention is made of its confirmed value against ascarids and small strongyles of horses. On the other hand some substances are quoted as being effective anthelmintics though their value is unconfirmed and in some cases may be contradicted, *e.g.* hexachlorethane against *Dicrocoelium* and pyrethrum against *Ascaridia*.

In the section on Entomology the author has made a notable attempt to bring up to date the information on treatment and control and he has included a great deal of new material. The available literature is diffuse, rather confusing, and somewhat incomplete, so it is perhaps not surprising that here and there the emphasis is wrongly placed. There is really too much emphasis on the use of DDT and not enough on the use of the more effective insecticides like BHC. Thus, for example, the section on lice control in cattle and sheep suggests that DDT is the insecticide of choice whereas, in fact, BHC is more effective, cheaper, and far more extensively used.

An error occurs on p. 435 1.6 where the 14-day dipping strength of arsenic is wrongly given.

The author mentions the development of insecticide-resistant strains of *Boophilus decoloratus*, and it is surprising that no mention is made of insecticide resistance by *Musca*.

On p. 420 1.13 the attachment sites for adult *I. ricinus* on sheep would be better rendered as "throat, ears, face, axillae, and groins."

There are several other minor points to which the specialist would take exception, but in general, Dr. Lapage can be congratulated on having performed a difficult task well and produced a book which will be of value to the veterinary student. "Mönnig" has for years been a standard text-book, and there seems no reason why this edition should not continue the tradition.

The book is well and clearly printed and there appear to be few mistakes in the text. The references have been collected together in a bibliography at the end of the book—a much better arrangement, though one could wish the bibliography had been a little more extensive.

ABSTRACT

Streptococcic Lymphadenitis of the Pharyngeal Region of Swine. COLLIER, J. R. (1956). *J. Amer. vet. med. Assoc.* **129.** 543-48.

The condition of pharyngeal abscess was consistently reproduced by feeding pigs with cultures of a Group E streptococcus, previously isolated from a field case of the disease. The lesions developed from foci of infection in the lymph nodes, especially the mandibular ones. The intranasal or intrapharyngeal installation of the organism gave similar results, but i/v, i/p, intragastric and intraenteric installation failed to reproduce the condition, as did the feeding of cultures of *C. pyogenes* or *Past. multocida*, indicating that when the latter are found in field cases of the disease they are probably acting only as secondary invaders.

These results indicate that food or water contaminated by the nasal mucus or abscess discharge from infected pigs can probably spread the condition and that, contrary to popular belief, trauma is not essential for the development of the lessions.

E. A. G.

In Brief.—*Concluded.*

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BIRD SONGS AT EVENTIDE

It seems that canaries sometimes exhibit a profound reluctance to sing, be it day or night. It is interesting to record, therefore, that this deficiency can now be corrected, thanks to the tireless efforts of Dr. A. Bachrach, a veterinary surgeon from Philadelphia. His discovery, in a nutshell, is that a daily dose of 1/100 grain of methyltestosterone, diluted with glucose and administered in a quarter of a teaspoonful of hard-boiled egg yolk, quickly brings song where before there had been only silence. An incidental, and possibly disadvantageous, effect of the treatment is that it prevents female canaries from laying eggs. Many people, no doubt, will be grateful to Dr. Bachrach for his work, but there must be others who are hoping that he will now look at the phenomena of song-production from the opposite point of view, and extend his studies to birds of another feather.—*The Pharmaceutical Journal.*

News and Comment

HEREDITARY DEFECTS IN CATTLE

In October last a Herd Book Society wrote to the British Veterinary Association to express its concern over operations, known to have been performed from time to time both in this country and abroad, on abnormal calves.

The Society felt that much harm could be done to a breed by successful operations for such hereditary defects as umbilical hernia or spastic conditions in animals intended to be kept for breeding purposes, and the B.V.A. was asked whether it would be prepared to take some action.

The Association agreed that such operations were to be deprecated, except on humanitarian or experimental grounds, and it was decided to ask the Technical Development Committee to collect all possible information on the present incidence of lethal and other undesirable hereditary factors in the cattle of this country.

The Technical Development Committee would welcome the co-operation of veterinary surgeons in this investigation. It is hoped to produce evidence which may guide cattle breeders in general, and any information that practising veterinary surgeons can supply concerning hereditary defects in cattle encountered in their practices will be most helpful.

THE ROYAL COLLEGE OF VETERINARY SURGEONS

The Council will proceed to nominate a member of the profession to receive the Frank Garnett Annuity, value £17 11s. 6d. The Annuity is intended to assist an aged member in straitened circumstances in recognition of his services to the profession. Applications or recommendations of suitable persons for the Annuity should be sent before May 20th, 1957, to the Registrar, at 9, Red Lion Square, London, W.C.1.

THE DISEASES OF ANIMALS (WASTE FOODS) ORDER

To reduce the risk of spreading foot-and-mouth and other animal diseases, the Gowers Committee recommended that, with the exception of local authorities, collectors of substantial quantities of waste food should be licensed. Effect has been given to this recommendation by the Diseases of Animals (Waste Foods) Order, 1957, which will come into operation on June 1st.

The Order provides that, in general, every collector of waste foods must boil the material in a licensed plant before feeding it or redistributing it for feeding purposes. Two categories of collectors do not need to have a licence for their boiling plant: (a) local authorities, and (b) persons having not more than four weaned pigs and 50 head of poultry, who boil waste foods for feeding their own stock on their own premises.

There is no change in the rule that no person (whether or not a collector) may feed unboiled waste foods or allow animals or poultry to have access to such material. There is an additional requirement that unboiled waste foods must not be allowed to come into contact with boiled material.

The new Order contains an important new prohibition on the carriage of animals or poultry in any road vehicle that is carrying either unboiled waste foods or containers that have not been disinfected. Vehicles and containers that have been used for unboiled waste foods must be disinfected before being used for carrying live-stock or anything connected with live-stock.

Copies of the Order may be obtained from H.M. Stationery Office, price 4d.

WITHDRAWAL OF RESTRICTIONS FROM THE CHANNEL ISLANDS

Following an outbreak of foot-and-mouth disease in Guernsey, an Order was made on March 25th, 1957, prohibiting the landing in Great Britain of animals, carcases and animal products, and hay and straw from the Channel Islands, other than Jersey.

As no further outbreaks of the disease have occurred in Guernsey, it has been decided to withdraw the import restrictions. An Order giving effect to this decision came into operation on April 19th, 1957.

FARMING ON TELEVISION

It has been announced that the B.B.C. will commence, in October, a weekly lunch-time television feature devoted to farming. The programme will be organised by the Midland Region, but all other B.B.C. Regions will co-operate.

During last year's Congress, at Leamington, the Midland Region was most generous in the time it gave on sound radio to veterinary affairs, and it therefore seems reasonable to believe that the new television programme will be sympathetic towards making known the great contribution of our science to agriculture.

THE ZOOLOGICAL SOCIETY OF LONDON

Mr. Oliver Jones, curator of mammals, and veterinary officer to the society, writes:—

It might be of interest to readers of THE RECORD to know that Council has decided to enter the pair of cream Shetlands and miniature phaeton into some of the horse shows this year. To this end the chaise has gone away to coach builders for a complete overhaul and repaint in order that it should be as near as possible in detail to the day it was made about 100 years ago. The turnout as such makes a very brave show and is used regularly throughout the summer season for giving children rides. It is pleasant to think that the Zoological Society is encouraging this sort of pleasurable exercise in these days when the horse is fast becoming a memory and ceasing to be a fact. One looks forward with anticipation to the appearance of this turnout in competition with others so regularly and immaculately put on show by enthusiasts such as the coaching fraternity, the large draught-horse owners, the vanners, and so on.

R.V.C. STUDENTS' UNION BALL

Readers will have noticed, under Coming Events, the announcement of the 165th Annual Ball of the Royal Veterinary College Students' Union Society which is to take place at the College on May 24th.

The programme sounds an ambitious and attractive one, and the Ball will last from 9 p.m. until 4 a.m. A buffet supper will be served, and during the course of the festivities there will be a number of novelties and original features. Tickets (double) are priced at 3 guineas each and a cordial invitation is extended by the Union's entertainments committee to the whole profession.

HOLIDAY EXCHANGES

Germany

Exchange

Boy of 18 (Brackwede) would like to visit England for about six weeks around August of this year, inviting an English guest to visit him either later this summer or next year.

Boy of 18 (Bad Sooden) would like to visit this country for about five weeks between July 12th and August 16th.

Girl of 18 (Meine) would like to exchange visits with a British girl of about her own age, visiting the U.K. herself between the end of June and the beginning of August, the return visit to take place later.

Girl of 18 (Lage/Lippe) would like to visit U.K., preferably London area or Southern England, for a month, from August 1st to 30th, 1957.

Boy of 16 (Grebendorf) would like to spend the summer holiday between July 19th and August 26th in the U.K. A guest could be received at his home for the same or a longer period either later, or concurrently with his own stay in this country.

Boy of eight (Nenndorf) would like to receive as guest an English boy of 10 or 12 years old, returning the visit himself in two or three years' time.

Exchange or Au Pair

Girl of 17 (Wetzlar) would like to visit the U.K. on exchange or *au pair* basis between July 15th and August 15th of this year.

Paying Guest or Exchange

Boy of 16½ and a girl of 14½, brother and sister, would like to visit the U.K. for about five weeks in July and August, preferably travelling together, but not necessarily staying with the same family.

IN PARLIAMENT

Rabbits

MR. HURD (April 18th) asked the Minister of Agriculture, Fisheries and Food what reports he has received up to the latest date of rabbits increasing in different parts of the country; and in which districts myxomatosis is still effective in checking this increase.

MR. GODBER: The latest report indicates some increase in rabbit numbers in most counties in England and Wales. Myxomatosis will not by itself prevent the rabbit population from building up once again, but in Hampshire, and to a lesser extent in Nottinghamshire and Pembrokeshire, the disease appears to have had some effect in checking the increase.

MR. HURD: Is my hon. Friend satisfied that the pest officers and pest committees in the counties have been doing their utmost to keep chasing these rabbits and getting farmers to chase them, and will continue to do so even through the breeding season and the summer?

Riding Schools

MRS. CASTLE (April 18th) asked the Secretary of State for the Home Department whether he will initiate legislation to make the registration of riding schools compulsory.

MR. SIMON: No. I have no information to suggest that such a requirement is necessary.

UNIVERSITY NEWS

Liverpool

Mr. H. V. Hughes, senior lecturer in charge of the Department of Veterinary Anatomy, is at present on leave to enable him to accept an invitation to visit the Vienna Veterinary School under the British Council Foreign University Interchange Scheme. He is also visiting the Brussels, Utrecht, and Munich Veterinary Schools.

RIDING ESTABLISHMENTS ACT, 1939

At a meeting of the Council of the British Veterinary Association held in Edinburgh recently, the Association's recommendations as to fees payable for work carried out by members of the profession for the purposes of the above Act were reviewed. The minimum fee recommended by the Association was increased, and members wishing to obtain further particulars are requested to get in touch with the General Secretary, B.V.A., at 7, Mansfield Street, W.1.

THE FITZWYGRAM, WILLIAMS, WALLEY AND LAWSON PRIZES

The Prize Board for the above prizes hereby gives notice that the subject selected for the essay competition open to candidates who obtain a registrable qualification in the calendar year 1957 is:—

> "It is suggested that there is an increase in the incidence of metabolic diseases of cattle under modern farming conditions. Discuss this hypothesis with special reference to the Milk Fever syndrome, Hypomagnesaemia, and Ketonaemia."

Intending candidates are referred to the regulations for the prizes on pages 495-6 of the Register of Veterinary Surgeons (1956), and may obtain any further information from the Registrar, R.C.V.S., 9-10, Red Lion Square, London, W.C.1.

THE COLONIAL VETERINARY SERVICE

New Appointments. D. F. Collings, Veterinary Officer, Tanganyika, and A. H. E. Pedersen (Dane), Temporary Veterinary Officer, Kaduna, Northern Nigeria.

D. G. Nelson, ex-Ghana, has now been transferred to Tanganyika as a Veterinary Officer.

THE REGISTER OF VETERINARY SURGEONS

Dr. Allyn Christian Laursen, D.V.M. (TORONTO), Stuart Cottage, Wyton, Huntingdonshire, was admitted on April 24th, 1957, to the Commonwealth List of the Register of Veterinary Surgeons.

ERRATUM

We regret that, in a paragraph published last week—"Irish Veterinarian Called to America"—the name of Mr. Cosgrove was inadvertently spelt Cosgrave.

PERSONAL

Births

GREENWOOD.—On April 15th, 1957, to Evelyn, wife of Ronald Greenwood, B.SC., M.R.C.V.S., at 60, Stanley Road, London, N.9, a daughter, Katherine.

MAGNUS.—On April 20th, 1957, to Eileen, wife of Alexander Magnus, M.R.C.V.S., 18, Etnam Street, Leominster, Herefordshire, a son.

PENMAN.—On March 29th, 1957, to June, wife of Gordon Penman, B.SC., M.R.C.V.S., of 6, Park Drive, Beech Grove, Whickham, Newcastle upon Tyne, a son, Paul Jonathan, a brother for Bruce.

SANFORD.—On April 17th, 1957, to Alma, wife of John Sanford, B.V.SC., M.R.C.V.S., of Flat 3, 19, Gambier Terrace, Liverpool, 1, a daughter, Janet Mary.

Marriage

SEDGWICK—MITCHELL.—At Newcastle upon Tyne, on April 20th, 1957, John Richard White Sedgwick, B.SC., M.R.C.V.S., of Cockermouth, to Anne Jennifer Mitchell of Newcastle.

Dr. A. W. Gledhill, B.A., M.R.C.V.S., of the National Institute for Medical Research, Mill Hill, has been awarded the degree of Sc.D. of Cambridge University.

COMING EVENTS

May

1st (Wed.). Meeting of the Southern Counties Veterinary Society at the Royal Hotel, Winchester, 7.30 p.m.

2nd (Thurs.). Annual General Meeting of the Society of Practising Veterinary Surgeons at the Grand Hotel, Birmingham, 2.30 p.m.

Annual General Meeting of the Central Veterinary Society at the Royal Veterinary College, Camden Town, N.W.1, 6 p.m.

3rd (Fri.). General Meeting of the Yorkshire Veterinary Society at the Royal Station Hotel, York, 2.30 p.m.

Meeting of the Mid-West Veterinary Association at the University of Bristol's Veterinary School, Langford House, Langford, 2.15 p.m.

General Meeting of the North of Ireland Veterinary Association in the Lecture Hall of the Pharmaceutical Society, 73, University Street, Belfast, 7.30 p.m.

8th (Wed.). UFAW Symposium on "Human Technique in the Laboratory" in the Harkness Hall, Birkbeck College, Malet Street, London, W.C.1, 9.45 a.m.

Fifteenth Annual General Meeting of the Society of Women Veterinary Surgeons at Glaxo Laboratories, Ltd., Greenford, Middlesex, 11.30 a.m.

9th (Thurs.). Annual General Meeting of the Essex Veterinary Society at the Essex Institute of Agriculture, Writtle, Nr. Chelmsford, 7.30 p.m.

15th (Wed.). Annual General Meeting of the A.V.T. & R.W.s Scottish Regional Group at the Hannah Dairy Research Institute, 10.50 a.m.

Meeting of the Section of Comparative Medicine, Royal Society of Medicine, at the Society's House, 5 p.m.

17th (Fri.). Meeting of the R.A.V.C. Division at the National Institute for Research in Dairying, Shinfield, Reading, 11 a.m.

18th (Sat.). Annual Dinner of the R.V.C. '52 Club at Ye Miller of Mansfield, Goring.

24th (Fri.). 165th Annual Ball of the Royal Veterinary College Students' Union Society at the Royal Veterinary College, Camden Town, N.W.1, 9 p.m.

June

5th (Wed.). Royal Veterinary College Association annual dinner at R.V.C., 6.30 for 7 p.m.

13th (Thurs.). Annual Dinner of the R.A.V.C. Officers' Club at the Grosvenor House, Park Lane, London, W.1.

July

10th, 11th and 12th, Wednesday, Thursday and Friday. Meetings of Council and Committees of the B.V.A. in London.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Dumfries. Park of Irongray (Apr. 15).
East Lothian. Myles Farm, Tranent (Apr. 13).
Fife. Coldstream Farm, Leven, Fife (Apr. 16).
Flint. Crossmill Farm, Penley, Wrexham (Apr. 15).
Lanark. Crosshouse Farm, East Kilbride, Glasgow (Apr. 15).
Leics. The Gables, Twyford, Melton Mowbray (Apr. 15).
Lincs. Thoresby Bridge Farm, Marshchapel, Grimsby; Rotherby House Farm, Skirth Road, Billinghay (Apr. 13).
Norfolk. Quaker Farm, Spixworth, Norwich (Apr. 12).
Shrops. Sutton House Farm, Sutton, Newport (Apr. 20).
Staffs. Abbey Farm, Abbey Green Road, Leek (Apr. 12).
Yorks Marton Cottage, Ouseburn, York (Apr. 12); Broadhouse Farm, Borrowby, Thirsk (Apr. 15).

Fowl Pest

Kent. Faggs Mount, Bethersden, Ashford (Apr. 18).

Lancs. Woodfield, Liverpool Road, Hutton, Preston (Apr. 12); 126, Midgeland Road, Marton, Blackpool (Apr. 13); Briar Bank, Haighton, Grimsargh, Preston; Hollins Farm, Leyland Lane, Leyland, Preston; Withytree Farm, 12, Church Road, Tarleton, Preston (Apr. 17); Balls Farm, Carr Lane, Tarleton, Preston (Apr. 18); Rosewood Farm, Liverpool Road, Hutton, Preston (Apr. 19); Tithebarn Meadows, Liverpool Road, Hutton Preston (Apr. 22).

Yorks. Hay-a-Parks Holding, Knaresborough (Apr. 17).

Swine Fever

Berks. Brook Farm, Martins Lane, Bracknell (Apr. 22).

Cornwall. Glebe Farm, Lezant, Launceston (Apr. 12); Oaklands, Hatt, Saltash (Apr. 22); Penhellick, East Taphouse, Liskeard (Apr. 15).

Hants. Fox Farm, Amport, Andover (Apr. 15); Crookhill Farms Ltd., Romsey Extra (Apr. 18); Moorcove, Pollards Moor, Cadnam, Southampton (Apr. 22).

Middx. 122, Bath Road, Harlington, Hayes (Apr. 16).

Oxford. Home Farm, Nuneham Courtenay (Apr. 22).

Somerset. Norton-sub-Hambdon, Yeovil (Apr. 12); Landrace Breeding Piggery, Redhill, Bristol (Apr. 22).

Surrey. Paines Hill House Farm, Cobham (Apr. 12).

Sussex. Warehead Farm, Halnaker, Chichester (Apr. 17).

Warwicks. Radbrook Farm, Preston-on-Stour, Stratford on Avon (Apr. 16).

Wilts. Home Stud Farm, Norman Court, West Tytherley, Salisbury (Apr. 16).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

The Corneal Graft

Sir,—I am sure that many of us who have contemplated the operation described by Mr. J. R. Holt (April 20th, 1957) will have been very interested in his article, and I personally should like to congratulate him on the care taken and the technique employed in this operation.

The opacity encountered in the case described, and believed by Mr. Holt to be due to mechanical interference after operation, is to be expected even without interference, as this is a first-stage reaction in the "take" of the graft.

The term "graft" when applied to transposition of homologous cornea is only a term of convenience, for by definition, the term implies the adoption by the host of the donor tissue in entirety, with the host serving as a purely nutritive element to sustain the implant. In the case of the cornea it is believed that, after dissociation from the donor, the grafted tissue undergoes degeneration of the cellular elements of the graft, this giving the characteristic opacity. In time inclusion of new cells from the host in the original donor stroma gives rise to a clearance of the tissue and a successful end result to the operation. I believe that in humans the determination of success is not made until 9 to 12 months after the transposition.

In specialised hands this operation should become relatively common in veterinary practice in the future. There is a great deal of experience at our disposal gained from human sources, and the common contra-indications and many other factors militating against successful outcome are well known without the necessity of trial and error judgments.

Yours faithfully,

C. N. S. LAKIN.

40 Woodbridge Road,
Guildford.

April 19th, 1957.

Bovine Obstetrics

Sir,—Mr. Straiton's colleagues take me to task on the meaning of malpresentation; in the original article we are told how to deliver a posteriorly presented calf—is this not a malpresentation? Mr. Straiton himself defines a normal presentation to us earlier in his article, saying that "if a calf is being born in the correct position, *i.e.*, with forelegs and head forward." If this is normal, and I believe it is, all else is abnormal or malpresented.

I am further accused of offering no constructive criticism. My main theme was that the delightful vagueness of the conditions described gave one no opportunity to criticise. Since Mr. Straiton has now amplified his article a little more I will now make some attempt.

Mr. Straiton makes the assertion that the calf is not so likely to die whilst inside the cow, due to the supply of nourishment from the navel cord. Once the foetal membranes have ruptured, does not separation of the foetal placenta from the maternal commence and automatically start to deprive nourishment from that source? Once this is so, then the alternative supply by the lungs is soon required. An unruptured navel cord in a separated foetal placenta is surely of little use. It is for this reason that I regard as dangerous Mr. Straiton's statement that he regards the rupture of the foetal membranes as dangerous both to the survival of the calf if left more than a few hours and to the eventual delivery due to drying, as mentioned by others. A live slippery calf, especially if relatively over-size, is a far better proposition than a dead dry one. In his adjunct Mr. Straiton says that he has often left premature parturition cases in labour for as long as seven or eight days, but does not tell us in what stage of labour, or if the membranes were ruptured all this time. We are told of a farmer who left a heifer in labour for three weeks. Evidence such as this, from a layman, however well-intentioned, is worthless as we have no evidence that the heifer was actually in labour all this time or at what time each stage of labour commenced. Evidence by hearsay is no evidence at all.

With regard to ring womb in ewes, I would refer Mr. Straiton to my paper in THE VETERINARY RECORD, November 1st, 1952, which applies as much to-day as it did then.

Yours faithfully,

J. B. WALSBY.

Silver House,
Midsomer Norton,
Bath.

April 20th, 1957.

Sir,—Mr. E. C. Straiton's article "Bovine Obstetrics with a Note on So-called Ring Womb in Ewes" was very useful in reminding us of the value of patience and controlled inactivity in dealing with many cases of difficult parturition, but surely its defect was in introducing an element of dogmatism to a subject in which dogma is least needed? Every case of dystocia is individual and needs special treatment. Sometimes time is our staunchest ally, while on other occasions it is our bitter enemy. It is unfair to condemn text-books on veterinary obstetrics as being full of impracticable advice, although we must all interpret this advice in the light of our experience. It is particularly vital to the student and the newly-qualified graduate to be able to draw on the experience of others who have been engaged in sorting out these problems of parturition for many years.

In this practice we are not troubled with the over-sized Friesian calf, but the type of sheep-farming presents us with an analogous problem in the ewe. In the hill country between Plynlimon and Cader Idris the breeding flock consists almost exclusively of the Welsh Mountain breed—the smallest in Great Britain apart from those of the Shetland and Orkney Isles. These ewes are crossed very widely with a variety of rams, the most popular being Kerry Hill, Suffolk, Clun Forest, Wiltshire, and Border Leicester, the last of which is one of our largest native breeds. So we have all the conditions for the relatively over-sized foetus, coupled with the fact that some of the ewes are so small as almost to prevent the introduction of the hand through the vagina. A small hand is a *sine qua non* for the successful sheep obstetrician!

We have frequently delivered a lamb weighing a little under 15 lb. from a ewe weighing not much more than 60 lb. To compete with this record the 1,000 lb. Friesian cow would have to produce a 250 lb. calf, and not start panicking for veterinary assistance for a mere 160-pounder!

It seems that the relatively over-sized foetus is more liable to become malpresented owing to there being less room for manoeuvrability in the uterus and pelvis, and therefore in a lambing season such as the present, when the grass has been growing practically throughout the winter and both ewe and foetus are in a good state of nutrition, there is a good deal more trouble from dystocia. Our figures for dystocia cases in the ewes dealt with in this practice over the last three lambing seasons seem to bear out a general impression that 1957 has been a particularly difficult season for sheep:—

1955. 108 lambing cases, including 12 caesarean sections.

1956. 225 lambing cases, including 25 caesarean sections.

1957, to April 18th. 405 lambing cases, including 45 caesarean sections.

We find that if we are able to introduce the hand through the pelvis and the lamb is alive, all cases of malpresentation can be corrected and the lamb delivered safely, no matter how big it is. In this, the use of epidural anaesthetic is invaluable for ensuring complete relaxation of the uterus and relief from pain.

However, a dead, swollen lamb combined with a dry, clinging reproductive tract is a different matter, and this is one of the chief indications for caesarean section.

Our percentage figures for the caesarean section have remained fairly constant for the last three seasons, but this year there has been an increase in the number of cases of ring womb. Last year the 25 caesareans included only six which were attributed to ring womb, whereas this year we have had 22 cases among our total of 45 caesarean sections. In every one of these cases the ring womb has been complicated by prolapse of the cervix and vagina, often involving the urinary bladder, and accompanied by great swelling, bruising, and discomfort. These cases are real emergencies as the continual straining of the ewe leads to exhaustion and a great danger of rupture of the vaginal wall with haemorrhage and a rapidly fatal termination. The condition of ring womb definitely exists, and we are surprised that anyone with experience of sheep practice should dispute it; but there is certainly some confusion as to the diagnosis, and a lack of knowledge as to the cause. The description given in the B.V.A. publication on sheep diseases bears little resemblance to the disease we know in mid-Wales.

It the foetus is not correctly presented, the water-bag will not exert pressure normally on the *os*, which will consequently not open completely, but this does not constitute ring womb. In such a case there is no danger of prolapse of the cervix and eversion of the vagina. We believe there is no connexion between malpresentation of the foetus and ring womb.

Our experience in this practice suggests that the season has some bearing on the cause of ring womb, and that conditions this season have been particularly favourable to its development.

We have experience of only the two breeds, Welsh Mountain and Kerry Hill, but we think the Kerry Hill is more susceptible to it.

There seems to be a definite association between twin lambs and ring womb, but this is not constant. Of our 22 cases this year 13 have had twins.

The hypotheses of a congenital weakness of the uterine muscles or a flaccid conformation of the vaginal region are not very sound, because we have often been presented with ewes which have previously had uneventful lambings, showing all the alarming symptoms of ring womb.

In view of the widespread and various disorders caused by a calcium-magnesium imbalance in the blood of pregnant ewes, we think there might be some connexion between this and ring womb. It is probably a sound idea to give any ewes with ring womb—which are not in immediate need of surgical help—an injection of a calcium-magnesium solution during the waiting period. After some years of using stilboestrol therapy for this condition in this practice we are convinced that it does more harm than good.

We hope very much that other members engaged in sheep practice will contribute to this discussion on ring womb, so that we may benefit from their experience and be in a better position to offer satisfactory advice to our clients and succour to our patients.

Yours faithfully,

F. B. EDWARDS,
IDRIS I. JONES.

Newgate,
Llanbrynmair,
Mont.

April 20th, 1957.

Sir,—I should like to add my congratulations to Mr. Straiton for his very interesting and thought-provoking article. The spate of letters—both sympathetic and critical—that has appeared in response to it, must leave no doubt in the mind of the writer that his article was worth while, and will provide some consolation to whichever of your scrutineers it was who has come in for criticism for suggesting publication.

It is to be hoped that many more experienced practitioners will join in this correspondence. It is significant that already a number of older practitioners of high repute have written sympathetically. I have no doubt that the younger members will derive much food for thought, and great benefit from all these contributions.

Many will reconsider their own approach to at least some of the calving and lambing cases they meet, and will also have more confidence in advising patience to both stockowners and herdsmen. I recall, when practising in Staffordshire during the last war, being interrupted in a tuberculin test by a highly excited owner, one of whose heifers was calving, and who wished me to break the just visible " water bladder," and commence traction. Something approaching a stand-up fight was necessary to persuade him to allow things to take a normal course. It was easy to understand why, at this farm previously, few animals calved without a torn vagina.

One type of abnormality in bovine parturition has not yet been mentioned, and although relatively uncommon, is, I think, worth recording. One occasionally sees a case in which there is a well-dilated cervix, and a normal presentation, and yet in which no effort to calve is made by the cow. Such a case is usually due to subacute hypocalcaemia, and will respond rapidly, and without manual assistance, to normal calcium therapy.

Yours faithfully,

E. P. BARRETT.

28, Stoke Road,
Guildford.

April 21st, 1957.

Sir,—With reference to Mr. Straiton's paper on bovine obstetrics, I feel there is much that is admirable in it, and perhaps some of our prejudices are due to the fact that our conventional ideas have been shaken. None the less, he seems to have generalised overmuch, and oversimplified the whole technique.

I cannot agree with his views on ring womb in ewes. In the past five years we, in this practice, have carried out something over 200 caesareans, a great many of them for ring womb. My experience, for what it is worth, has been as follows.

The true ring womb, complete or partial, will not relax at all, even if left for several days. We have found all methods of treatment unsatisfactory and caesarean section or slaughter seem the only alternatives.

In most instances if the animal is left more than 10 hours after rupture of the membranes, the lambs are dead, and if left for some days (as Mr. Straiton advocates) putrefaction has set in. Also the ewe is exhausted and a poor operational risk.

Many cases diagnosed by the farmer as ring womb are not so, in fact, but merely protracted cases of labour due to a variety of causes (uterine inertia, over-fat ewes, etc). In such cases Mr. Straiton's principles apply, and the ewe will lamb normally if given time.

The ewe operated on for ring womb will in almost every case lamb normally in subsequent cases, we have, in fact, only operated on four ewes which " ringed " on two occasions.

Yours faithfully,

A. CAMERON GIBSON.

5, Portland Street,
Ilfracombe.

April 21st, 1957.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
16th to 31st March, 1957		31	—	2	19	—	32
Corresponding period in	1956	139	—	—	23	—	31
	1955	42	—	—	18	—	71
	1954	11	—	1	43	—	53
1st January to 31st March, 1957		133	2	15	251	—	213
Corresponding period in	1956	822	3	8	171	—	153
	1955	267	—	6	166	—	312
	1954	71	—	11	411	—	335